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IS 6774 (2006): Classification of essential oil-bearing aromatic plants [PCD 18: Natural and Synthetic Fragrance Materials]

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भारतीय मानक

सुगन्ध तेल वाले पौधों का वर्गीकरण

(पहला पुनरीक्षण)

Indian Standard

CLASSIFICATION OF ESSENTIAL OIL-BEARING AROMATIC PLANTS

(First Revision)

ICS 71.100.70

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Price Group 7

Natural and Synthetic Fragrance Materials Sectional Committee, PCD 18

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Natural and Synthetic Fragrance Materials Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This standard was first published in 1972. This revision is carried out to update the classification in line with prevalent international practices.

Information has been covered on the proper identity of the basic plant material, yield of essential oil, harvesting season and such other relevant data of interest to producers, consumers and the trade. This standard tabulates available data on these and other important aspects considered useful for optimum and economic production and utilization of essential oils from aromatic plant material.

This standard, of necessity, does not include information on all essential oil-bearing plants but only those which are at present considered important from economic point of view.

Since among other data, the essential oils are of major interest to the users of this standard, these have been listed in alphabetical order in Table 1, col 2.

A number of Indian Standards on natural essential oils are available and a few more are at different stages of preparation. Table 1, col 5 gives information regarding the current publication of Indian Standards for essential oil. This column necessarily is subject to modification and/or supplementation, whenever an old standard is revised or a new one is published.

Indian Standard

CLASSIFICATION OF ESSENTIAL OIL-BEARING AROMATIC PLANTS

(First Revision)

1 SCOPE

This standard covers classification of aromatic plants used for the production of essential oils, which are at present of interest to the Indian Perfumery Industry. It provides information in Table 1, on the botanical identity of the essential oil-bearing aromatic plants, their pattern of availability, habitats, economic stage of growth, and harvesting seasons; parts of the plants used for processing, method of processing and yields of essential oils; existence of Indian Standards and important uses of the plant materials and/or oils.

2 REFERENCES

The following standards contain provisions, which through reference in the text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
327 : 1991	Oil of lemongrass — Specification (*second revision*)
328 : 1992	Oil of eucalyptus globules — Specification (*second revision*)
329 : 1993	Oil of sandalwood — Specification (*second revision*)
512 : 1988	Specification for oil of citronella (Java) (*second revision*)
526 : 1988	Specification for oil of palma rosa (*second revision*)
528 : 1999	Oil of mentha aarvensis — Specification (*first revision*)
533 : 1998	Gum spirit of turpentine (oil of turpentine) (*second revision*)
587 : 1997	Oil of geranium — Specification (*third revision*)
761 : 1988	Specification for oil of ginger (*first revision*)
1177 : 1996	Oil of vetiver (cultivated and khus) — Specification (*second revision*)
1615 : 1996	Oil of himalayan cedar wood — Specification (*second revision*)
3146 : 1991	Oil of celery seed — Specification (*first revision*)
3147 : 1992	Oil of dill seed — Specification (*first revision*)
3398 : 2003	Oil of patchouli — Specification (*first revision*)
4403 : 1979	Specification for AJOWAIN (*first revision*)
6597 : 2001	Glossary of terms relating to fragrance and flavour industry
15068 : 2001	Oil of cardamom (Ellettaria cardamomum maton) — Specification

3 TERMINOLOGY

For the purpose of this standard, definitions given in IS 6597 shall apply.

Table 1 Classification of Essential Oil-Bearing Plant Materials

(*Foreword* and *Clause* 1)

Sl No. (1)	Essential Oil (2)	Botanical Identity of Plant (3)	Part(s) of Plant Used (4)	Indian Standard (5)	Habitat (6)	Pattern of Availability (7)	Economic Stage of Plant Growth (8)	Harvesting Season (9)	Processing (10)	Yield of Essential Oil, Percent (11)	Uses/Remarks (12)
1.	Agarwood	*Aquilaria malaccensis* Lam. syn. A. *agallocha* Roxb. (Thymelaeaceae)	Wood	—	Eastern Himalayas, Bhutan, parts of West Bengal, and particularly Assam on the hill forests of Khasia, Garo, Naga, Cachar and Sylhet	Indigenous	Usually 50 to 60 years old trees infested with fungus	All round the year	Chips are soaked in water for 4.-5 days, then grounded to small pieces, further soaked in water for 2 days and steam-distilled	0.09-2.19	Wood stem-carminative, aphrodisiac; ATTAR is highly priced in perfumery industry
2.	Ajowain	*Trachyspermum ammi* (Linn.) Sprague ex Turril syn. *Carum copticum* Benth ex Hiern. (Apiaceae/ Umbelliferae)	Fruit	IS 4403	Cultivated as rabi crop in Indian plains	Indigenous	Mature fruits, fresh and air-dried	April	Stream distillation	4.0-6.0 of oil containing 45-55 percent thymol	Fruit, used as stomach-carminative in colic and flatulence etc; the oil is a source of natural thymol
3.	Anise	*Pimpinella anisum* L. (Apiaceae)	Fruit	—	Native of Greece and Egypt, also cultivated in China, Vietnam, Russia and Europe	Imported	4 months after sowing seeds	Early spring	do	2-3	Mainly in flavours for dentifrices, liquors, etc
4.	Bellary leaf	*Neolitsea cassia* L. Kosterm (Lauraceae)	Leaf	—	Forests of Western Ghats, the Nilgiris and other parts of South India also in Australia	Indigenous	Mature	All round the year	Steam distillation and fractionation under reduced pressure	0.05-0.22	The oil has a sweet sharp odour resembling unripe mangoes
5.	Bergarnot	*Citrus aurantium* Linn. subsp *bergamia* (Risso & Poit) Wight and Arn. (Rutaceae)	Fruit	—	Calabria (Italy) in alluvial soil, rarely in India	Imported	15-40 years old trees when the yield of oil is maximum	December to March when the fruit approaches maturity	Expression	About 0.5	In perfumery and cosmetics

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
							(about 1 kg per tree)				
6.	Boise de Rose	a) *Aniba rosaeodora* Ducke var. *amazonica* (Lauraceae)	Wood	—	Brazil, French, Guiana	Imported	10-15 years old trees with about 30 cm diameter	April-July	Steam distillation	0.7-1.2	In the isolation of linalool; in soaps and fine perfumes
		b) *Aniba parviflora* Mez (Lauraceae)	—	—	Brazil	—	—	—	—	—	—
		c) *Ocotea caudata* Mez syn. *Licaria guianensis* Aubl. (Lauraceae)	—	—	Guiana	—	—	—	—	—	—
		d) *Protium altissimum* March (Burseraceae)	—	—	Tropical America	—	—	—	—	—	—
7.	Calamus, Sweet flag	*Acorus calamus* Linn. (Araceae)	Rhizomes	—	Throughout India in marshes, at the slopes of Himalayas at 1 500 m heights	Indigenous	Mature in about a year, 1½ tonne of dry rhizomes per acre	—	Steam distillation	1.5-3.5	Emetic, used in dyspepsia and colic; oil used in flavouring liquors and perfumes
8.	Cananga (ylang ylang)	*Cananga odorata* (Lam.) Hook. f. & Thoms (Annonaceae)	Flowers	—	First introduced in India in 1797, it is now occasionally planted in gardens	Indigenous	After the trees are about four years old. Only mature, yellow flowers	Flowers are collected about dawn, during warm an sunny weather. Should be distilled soon after collection	do	0.4-2.25	Used for the finest and high class perfumery preparations and cosmetics. Cheaper grades used in soap making. May also be used as a fixative
9.	Caraway	a) *Carum carvi* Linn. (Apiaceae/ Umbelliferae)	Fresh fruits	—	Cultivated mainly in foreign countries, found in small patches in Kashmir	Mainly imported	15 months after sowing in cold regions	Morning hours of sunny days	do	3-7	Oil and carvone separated from it are used in medicine as stomachic and carminative; also

Table 1 *(Continued)*

Sl No. (1)	Essential Oil (2)	Botanical Identity of Plant (3)	Part(s) of Plant Used (4)	Indian Standard (5)	Habitat (6)	Pattern of Availability (7)	Economic Stage of Plant Growth (8)	Harvesting Season (9)	Processing (10)	Yield of Essential Oil, Percent (11)	Uses/Remarks (12)
											used in perfumery and toilet preparations and in the flavouring of food products, such as sausage, pickles and confectionery, as well as liquors
		b) *Bunium persicum* Fedts. syn. *Carum bulbocastanum* Clarke non-Koch (Black Caraway) (Apiaceae/ Umbelliferae)	Seeds (and tubers)	—	Kashmir eastward to Garhwal and Kumaon at 1 500-3 000 m heights; Baluchistan and Afghanistan	Mainly indigenous	When most of the fruit is mature	June to October	Steam distillation	About 2	As spice and as carminative in indigenous medicines. Also to protect woolen cloth against insect pests
10.	Cardamom	*Elettaria cardamomum* Maton (Zingiberaceae)	Fruit	IS 15068	Grows as plant mainly in Kerala, Tamil Nadu and Karnataka	Indigenous	Green fruit	Malabar — August to January; Mysore — August to April	do	3-7	For flavouring curries, cakes, bread, liquors and other culinary purposes. In medicine used as carminative
11.	Cedarwood Himalayan	*Cedrus deodara* (Roxb.) Loud. (Pinaceae)	Sawdust chips & fresh wood shavings	IS 1615	Northwest Himalayas from Kashmir to Garhwal (1 800 – 3 000 m)	Indigenous	On maturity of the tree when there is full development of heartwood	Throughout the year	do	1.5-2.5	As an ingredient in deodorants and in soap perfumes
12.	Celery seed	*Apium graveolens* Linn. (Apiaceae/	Seeds and dry fruits	IS 3146	Seasonal rabi crop, cultivated mainly in	Exotic, cultivated in	When the seeds are ripe	When fruits are fully ripe	do	2-3 from dry fruits	Seeds and seed oil as cordial carmi-

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		Umbelliferae)			the Punjab plains	India	(8-9 months)	and shade dried			native, and diuretic; used in bronchitis, asthma and for liver and spleen disorder. Also as flavouring agent and as an ingredient in perfumes
13.	Cinnamom bark	*Cinnamomum verum* Presl syn. *C. zeylanicum* Bl. (Lauraceae)	Stem-bark	—	Native of Ceylon, cultivated in India	Indigenous	Fully developed shoots when 1.2-2.5 m high	Rainy season	do	0.2-1.0	Flavouring agent in foodstuffs, also in perfumes and medicine
14.	Cinnamom leaf	*Cinnamomum verum* Presl syn. *C. zeylanicum* Bl. (Lauraceae)	Leaves	—	Wild in Ceylon, cultivated in South India	Indigenous	3 years after planting	Just before leaves are fully mature	do	0.5-1.0	A source of eugenol
15.	Citronella (Ceylon)	*Cymbopogon nardus* (L.) Rendle var. *nardus* syn. *Andropogon nardus* L. (Poaceae/ Gramineae)	Leaves	IS 512	Locally called lenabatu, Batu and Pana Pengiri forms cultivated on a large scale in Ceylon. Also in Seychelles, Java and Tanganikyas. Also cultivated in India	Imported and indigenous production also	8 months after planting	Throughout the year	Steam distillation of partially dried grass	0.22-0.85	As ingredient of soap perfume; also as a mosquito repellant
16.	Citronella (Java)	*Cymbopogon winterianus* Jowitt syn. *Andropogon nardus* auct, non Linn. (Poaceae / Gramineae)	Leaves	IS 512	Indigenous in Taiwan, and Indonesia. Also cultivated in India	Largely imported, small indigenous production	After 2-5 years of planting	Thrice a year	Water and steam distillation of partially dried grass	0.5-1.2	As a source of geraniol and citronellal. Also used as such in perfumery
17.	Clove tree	*Syzygium aromaticum* (Linn.) Merr. & L. M. Perry syn. *Eugenia*	Flower bud stem, leaf and roots	—	Native of Moluccas cultivated in South India	Imported	Trees above 8 years old	January and July	Steam distillation	Buds 14-23; stem, leaf and roots 4-6	Dried clove buds used in confectionery and spice. Oil in medicine and

Table 1 *(Continued)*

Sl No. (1)	Essential Oil (2)	Botanical Identity of Plant (3)	Part(s) of Plant Used (4)	Indian Standard (5)	Habitat (6)	Pattern of Availability (7)	Economic Stage of Plant Growth (8)	Harvesting Season (9)	Processing (10)	Yield of Essential Oil, Percent (11)	Uses/Remarks (12)
		caryophyllata Thunb. (Myrtaceae)									perfumery; is a source of eugenol for conversion into high grade vanillin
18.	Coriander	*Coriandrum sativum* Linn. (Apiaceae/ Umbelliferae)	Fruits	—	Cultivated - commercially in India	Indigenous	Mature fruits	Mainly January-April	Steam distillation	0.15-0.25	Flavouring agent in food stuffs
19.	Costus roots	*Saussurea costus* (Falc.) Lipsch. syn. *S. lappa* Sch.-Bip. (Asteraceae/ Compositae)	Roots	—	Found wild in Western Himalayas at 2 000 – 4 000 m height. Cultivated in Chamba, Lahul, Spiti and Pangi regions of Himachal Pradesh	Indigenous	3-4 years old plant	During Autumn months (Sep-Oct) when aerial parks begin to die down	do	0.6-0.28	Roots as tonic, and carminative, also in skin disease and rheumatism. Oil-aromatic, used on a small scale in perfumery; burnt as incense in Buddhist temple
20.	Cumin	*Cuminum cyminum* L. (Apiaceae/ Umbelliferae)	Fruits	—	Cultivated in India	Indigenous	Mainly January - April	Mature fruit	do	3.0-7.0	Flavouring of the food products, and confectionery
21.	Davana	*Artemisia pallens* Wall. ex DC. (Asteraceae/ Compositae)	Leaves and Flowers	—	Seasonal winter crop cultivated in Mysore, Andhra, Madras and Kerala	Indigenous	Ten weeks after transplanting when a few flowers are fully open and others are in buds	Late autumn	do	0.15-0.5 from air dry herb	In high grade perfume

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
22.	Dill	a) *Anethum graveolens* (Linn.) var.*submarginatum* Leiune et Courtois (Apiaceae/ Umbelliferae)	Fresh leaves	—	European dill is under experimental cultivation	Imported	Three months after sowing of seed	Herbs at fruiting stage	do	Fresh herb - 0.062 to 1.5 depending upon the stage of maturity	Largely as a food Flavour in Europe and America
		b) *Anethum sowa* Roxb. (Apiaceae/ Umbelliferae)	Fresh leaves	IS 3147	Indian dill cultivated throughout the country	Indigenous	—	—	—	—	—
23.	Dill Seeds	a) *Anethum graveolens* (European dill) Linn. var. *submarginatum* Leiune et Courtois (Apiaceae/ Umbelliferae)	Seeds/fruits	—	European dill is under experimental cultivation	Imported	When the seeds are just matured and green	Summer	Steam distillation	3.0-3.5	Oil from the seeds carminative, useful in flatulence of children. An ingredient of gripe water and dill waters
		b) *Anethum sowa* (Indian dill) Roxb. (Apiaceae/ Umbelliferae)	Seeds/fruits	IS 3147	India dill cultivated throughout the country	Indigenous	Three months after sowing of seed	Summer	do	0.062 to 1.500 depending upon the stage of maturity	For food flavouring in Europe and America
24.	Eucalyptus	a) *Eucalyptus citriodora* Hook. (Myrtaceae)	Leaves	—	Mainly in North India, Nilgiris and Mysore	Imported; also introduced in India; indigenous	After three years of planting	Three clippings a year depending upon the climate	do	0.5-2.0	In perfumery. Also a source of citronellal
		b) *Eucalyptus globulus* Labill. (Myrtaceae)	Leaves	IS 328	Nilgiris (1 520-2 530 m) Annamalai and Palni Hills on small scale, Shimla (HP) (1 220-2 140 m) and Shillong Hills (Assam) NE	Introduced in India	When the plant is about 8 years old	Throughout the year excepting winter when the oil content is low	do	0.9-1.2	In medicine, perfumery and for isolation of cineole

Table 1 *(Continued)*

Sl No. (1)	Essential Oil (2)	Botanical Identity of Plant (3)	Part(s) of Plant Used (4)	Indian Standard (5)	Habitat (6)	Pattern of Availability (7)	Economic Stage of Plant Growth (8)	Harvesting Season (9)	Processing (10)	Yield of Essential Oil, Percent (11)	Uses/Remarks (12)
25.	Garlic	*Allium sativum* L. (Liliaceae)	Bulbs	—	Cultivated in India	Indigenous	Mature bulbs	Winter season	Steam distillation	0.1-0.2	Flavoring agent for meat preparations, soups, canned goods and table sauces
26.	Geranium	*Palargonium graveolens* L. 'Herit ex Aiton' (Geraniaceae)	Leaves	IS 587	Native of East Africa, cultivated in India	Largely, imported, small indigenous production	2nd year of growth	Just before the plant flowers	Water distillation	0.15-0.20	Perfumery and toilet goods
27.	Ginger	*Zingiber officinale* Rosc. (Zingiberaceae)	Rhizomes	IS 761	Widely cultivated in India	Indigenous	Fully mature Rhizomes	When the leaf stem turns yellow	Steam distillation	Dried rhizomes - 1.5-3.0; air dry scrapings - about 0.8	Rhizome as carminative and flavouring agent; oil marketed in Europe for food Flavours and stimulating remedies
28.	Ginger grass	*Cymbopogon martinii* (Roxb.) Wats. var. *sofia* (Poaceae/ Gramineae)	Upper leaves and flowering tops	IS 526	Grows wild mainly in Madhya Pradesh, Andhra Pradesh, Maharashtra and Mysore	do	Flowering stage before seeding	When the plant is in full bloom (October - December)	Water and steam distillation	0.15-0.40	Oil as an ingredient of soap perfume
29.	Hina	*Lawsonia inermis* (L.) syn. L. alba (L.) (Lythraceae)	Leaves	—	Cultivated throughout India	do	2nd year onwards	April-May and October-November	Steam distillation	0.01-0.02	In perfumery and for dyeing the hair
30.	Jasmine	*Jasminum officinale* L. var. *grandiflorum* (L.) Kobuski,	Flower	—	Cultivated throughout India	do	1-15 years of plantation	The best yield and quality of	Enfleurage or solvent extraction or steam	0.22-0.26	In perfumery. Blends very well practically with any

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		Jasminium sambac (Oleaceae)						perfume is obtained from flowers collected early in the morning	distillation		floral scent, leading to smoothness and elegance
31.	Kasturi Manjal (Turmeric wild)	*Curcuma aromatica* Salisb. (Zingiberaceae)	Rhizomes	—	Wild throughout India; cultivated chiefly in Bengal and Kerala	do	—	When the leaves start browning	Steam distillation	About 6.0	Tonic and carminative; externally applied in combination with astringents
32.	Kewda	*Pandanus fascicularis* Linn. (Pandanaceae)	Flowers	—	Grows mainly in marshy places. Cultivated in Orissa which accounts for 90 percent of Indian production	do	Mature plants	July-October	do	0.1-0.3	Kewda, Attar and Kewda water are popular on festive occasions such as marriages
33.	Lavender (French)	*Lavandula angustifolia* Mil. *officinalis* Chaix *and vera* DC. (Lamiaceae/ Labiatae)	Fresh blossoming tips	—	Native of Mediterranean region, South France and Italy. Also cultivated in India	Imported indigenous also	During full bloom in 4th/ 5th year of growth	August-October	Water and steam distillation	0.7-0.9	In perfumery and soap industry
34.	Lavandin	*Lavandula hybrida* Rever chen (Lamiaceae/ Labiatae)	Fresh blossoming tips	—	South France	Imported	When the plants are in full bloom	August-September	Water distillation	0.5-1.0	Perfumery and soap industry
35.	Lemon	*Citrus limon* (L.) Burm. f syn. *Citrus medica* Linn. var. *limonum* Citrus limonum Risso (Rutaceae)	Fresh rind of the nearly ripe fruits	—	India, Sicily, California, Calabria, Spain Brazil and Argentina	Mainly imported	Economic fruiting commences in 6th year	Winter and Summer	Expression	0.3-0.6	In perfumery and soap industry
36.	Lemon-grass	*Cymbopogon*	Leaves and	IS 327	Wild growth as well	Indigenous	2nd and 3rd	After	Water and steam	0.25-0.50	In perfumery, soaps

Table 1 (*Continued*)

Sl No.	Essential Oil	Botanical Identity of Plant	Part(s) of Plant Used	Indian Standard	Habitat	Pattern of Availability	Economic Stage of Plant Growth	Harvesting Season	Processing	Yield of Essential Oil, Percent	Uses/Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		flexuosus (Ness ex Steud). Wats. (Poaceae/ Gramineae)	flowering tops		as cultivated commercially		year of planting	maturity at the end of May and then every 35 or 40 days till November / December	distillation	(fresh)	and cosmetics, and as a raw material in chemical industry
37.	Lime	*Citrus aurantifolia* (Christm.) Sw.syn. *C. medica* var. *acida* Hook. f. (Rutaceae)	Skin of the fruit	—	Cultivated mainly in South India	Indigenous	4-5 years of growth mature fruits	April-August	Cold expression and steam distillation	0.20-0.48	Unripe fruit as digestive, tonic appetizer. Oil mainly used in confectionery, pharmaceuticals, and toilet preparations
38.	Linaloe Berries	*Bursera delpechiana* Poiss, ex Engl. (Burseraceae)	Husk of the berries	—	Native of Mexico, under small scale cultivation in India	Exotic; cultivated	Fully ripe berries	Mature berries produced annually from a plant of 6-7 years age and onwards	Water and steam distillation	Air dry husk – 10-14	In high grade perfumery, cosmetics and soap
39.	Mullilam	*Zanthoxylumn limonellla* (Dennst) Alston. syn. *Z rhetsa* (Roxb.) DC (Rutaceae)	Fruit	—	Mainly in Mysore, Kerala, Kashmir and Meghalaya	Indigenous	Fruiting	When the fruits are fully ripe	Steam distillation	3.0-5.8	Fruit-aromatic, astringent, stomach stimulant prescribed in dyspepsia. In perfumery
40.	Nagarmo-tha or Cyperus	*Cyperus scariosus* R. Br (Cyperaceae)	Rhizome	—	Common in damp places and in crop	do	One year of growth when	All round the year	do	0.5-1.0	Tubers-aromatic, cordial; oil-aromatic

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					fields in Bengal		the tubers are formed				and in perfumery
41.	Nutmeg	*Myristica fragrans* Houtt. (Myristicaceae)	Fruit	—	Mainly found in Indonesia and West Indies. Cultivation is confined to gardens of the Nilgiris, Kerala, Andhra Pradesh and West Bengal	Exotic cultivated	Trees bear fruits from 7th year; full bearing at 20 to 30 years	Fruiting all the year round	Low pressure steam distillation	Nutmeg 5-16, Mace 4-15	Use in toilet preparations, medicinal products, flavouring essences, chewing gums, etc
42.	Ocimum	a) *Ocimum basilicum* L. (Lamiaceae / Labiatae)	Leaves, stalks and flowering tops	—	Cultivated occasionally in gardens (indigenous to Punjab)	Indigenous	After one year	At the time of flowering	Steam distillation and rectification in vacuum	0.3-0.5	As a flavouring agent
		b) *O. americanum* L. (Lamiaceae/ Labiatae)	do	—	Wild	do	do	do	do	0.38-0.7	In soap perfumes and cosmetics
		c) *O. gratissimum* L. (Lamiaceae/ Labiatae)	do	—	Cultivated	do	do	Whenever there is a good flush of leaves	do	About 0.1	Expectorant and antiseptic
		d) *O. sanctum* L. (Lamiaceae/ Labiatae)	do	—	do	do	do	do	do	0.3-0.7	Expectorant and antiseptic
43.	Onion	*Allium cepa* L. (Liliaceae)	Bulb	—	Cultivated in India	do	Mature bulbs	Winter season	Steam distillation	0.018-0.050	Flavouring of meats sausages, soups table sauces and other culinary preparations
44.	Orange bitter	*Citrus aurantium* L. ssp. *amara* Linn. (Rutaceae)	Peel of fruit	—	Mainly in Andhra Pradesh	Imported	Mature fruits	June to early October	do	1.6-2.5	A valuable adjunct in the flavouring of beverages, confectionery, and baked goods; also used in perfumes, toilet

Table 1 (*Continued*)

Sl No. (1)	Essential Oil (2)	Botanical Identity of Plant (3)	Part(s) of Plant Used (4)	Indian Standard (5)	Habitat (6)	Pattern of Availability (7)	Economic Stage of Plant Growth (8)	Harvesting Season (9)	Processing (10)	Yield of Essential Oil, Percent (11)	Uses/Remarks (12)
											waters and cosmetics
45.	Orange Mandarin (Loose skinned)	*Citrus reticulata* Blanco (Rutaceae)	Whole fruit and peels	—	Mostly cultivated in Assam, MP, Punjab and Coorg (Mysore), also in Sikkim	Indigenous	Mature fruits	November-December	Expression (cold pressed)	About 0.1	Fruit-laxative, aphrodisiac, astringent, tonic relieves vomiting
46.	Orange (sweet)	*Citrus sinensis* (L.) Osbeck (Rutaceae)	Rind of fruit	—	Mainly in North India, Andhra Pradesh and Maharashtra	do	do	Mainly November-March	Steam distillation	0.11-0.58 on whole fruit	Flavouring agent for food products; also employed in pharmaceutical and oral preparations in order to convert objectionable odours; also used in perfumes, and toilet preparations
47.	Palmarosa	*Cymbopogon martini* (Roxb.) Wats. var *motia* (Poaceae/ Gramineae)	Upper two-thirds of the plant	IS 526	Grows wild in Madhya Pradesh, Maharashtra, Andhra Pradesh and Mysore. Also cultivated	do	At full bloom	Flowering stage	Water and steam distillation	1.22-1.50 (dry weight) 0.25-0.30 (fresh)	In perfumery, soap and cosmetic industry. Also for industrial isolation of geraniol
48.	Patchouli	*Pogostemon cablin* Benth. syn. *P. patchouli* Pellet. var. *suavis* Hook. (Lamiaceae/Labiatae)	Leaves	IS 3398	Grown in Indonesia and Malaysia. Cultivated in India also	Imported and indigenous	1-3 years of growth	Twice a year before the leaves turn brown	do	3.0-3.5	For high grade perfumery, cosmetics and soaps
49.	Pepper	*Piper nigrum* Linn. (Piperaceae)	Fruits	—	Malabar is the original home	Indigenous	Mature fruits	December-March	Steam distillation	1-3.5	For flavouring of foodstuffs and beverages

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
50.	Peppermint	a) *Mentha arvensis* L. (Lamiaceae/ Labiatae)	Whole aerial plant	IS 528	Cultivated in India	Indigenous	4 months after planting	When the plants are in flowers	do	0.4-0.5	Source of menthol; used in medicines, toiletries and cosmetics
		b) *Mentha piperita* Linn. (Lamiaceae/ Labiatae)	Whole aerial plant	—	Native of Mediterranean countries. Introduced in India in Kashmir, Uttar Pradesh and Nilgiris	Mainly imported	After first year of planting	When the plant is in flowers	do	0.2-0.4	In medicines as a carminative; also used to flavour pharmaceuticals and oral preparations
51.	Petitgrain	*Citrus aurantium* L. var. *bigardia* Wath (Rutaceae)	Leaves and twigs	—	Paraguay, also Brazil and South Europe	Imported	4 years after planting	3 to 4 times per year	do	0.25-0.50	Perfumery, colognes and for soaps
52.	Rose	*Rosa damascena* Mill. (Rosaceae)	Flowers	—	Commercially cultivated mainly in UP	Indigenous	15 months after starting cultivation but the maximum number of flowers are obtained till the 4th or the 5th year. Carefully maintained plantations remain productive up to 40 years	Early hours of morning in March	Steam distillation soon after harvesting	0.01-0.03	In high grade perfumes largely for flavouring soft drinks, alcoholic liquors and tobacco, particularly snuff and chewing tobacco. Also used in lotions and eye washes
53.	Rosemary	*Rosmarinus officinalis* Linn. (Lamiaceae / Labiatae)	Leaves, twigs and flowering tops	—	Native of Mediterranean countries cultivated in India also	Imported and indigenous	Harvesting every third year	August-September after flowering	Water and steam distillation	0.4-0.8	Perfumery and soap industry, flavouring food and in medicine
54.	Sandal-wood	*Santalum album* Linn. (Santalaceae)	Heartwood	IS 329	Grows wild in Mysore, Andhra	Indigenous	After full development	Mature tree	Steam distillation	4.5-6.0	High grade perfumery and

Table 1 *(Concluded)*

Sl No. (1)	Essential Oil (2)	Botanical Identity of Plant (3)	Part(s) of Plant Used (4)	Indian Standard (5)	Habitat (6)	Pattern of Availability (7)	Economic Stage of Plant Growth (8)	Harvesting Season (9)	Processing (10)	Yield of Essential Oil, Percent (11)	Uses/Remarks (12)
					Pradesh, Madras, and Maharashtra. Also cultivated		of heartwood				cosmetics
55.	Spearmint	*Mentha spicata* L. (Lamiaceae)	Stem and leaves	—	Mainly USA; Also cultivated in China and India	Imported and indigenous	4 months after planting	When flowering	Steam distillation	0.3-0.4	Flavour for dentfrices and chewing gum
56.	Spike Lavender	*Lavandula latifolia* Madic. (Lamiaceae/ Labiatae)	Flowering tops	—	Temperate counries bordering Western Mediter-ranean	do	After flowering	August-September	Water and steam distillation	0.88-1.10	Perfumery and soap industry
57.	Tomarseed	*Zanthoxylum acanthopodium* DC (Rutaceae)	Fruit	—	Sub-tropical Himalayas from Kumaon to Sikkim (up to 3 000 m height) and Khasia Hills from 1 000 to 2 000 m height	Indigenous	Fruiting	Mature fruits	Steam distillation	1.5-1.6	Fruit as carminative, oil as aromatic
58.	Turpentine	*Pinus roxburghii* Sargent and other Pinus Spp. (Pinaceae)	Oleoresin of tree exudation	IS 533	Outer Himalayan Ranges from Indus to Bhutan (450-2 300 m) and P. *khasiana*) in Eastern Himalayas	do	About 30 cm in diameter and above 150 cm in height	March-November	do	18-19 oil, contain 40 α & β pinene	Oil as source of a large number of industrial chemicals, perfumery compounds and isolates. Resin in solder flux, soaps and paints and varnishes
59.	Vetiver (cultivated)	*Vetiveria zizanioides* (Linn.) Nash	Roots	IS 1177	Cultivated throughout India,	Indegenous	8-19 months old plants	October-December	Water distillation	0.18-1.0	In perfumery and flavouring agents

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		(Poaceae/ Gramineae)			mostly in South India						
60.	Vetiver (Khus)	*Vetiveria zizanioides* (Linn.) Nash (Poaceae/ Gramineae)	Roots	IS 1177	Grows wild in North India and utilized commercially in Bharatpur (Rajasthan)	do	15-19 months old plants	Dry period	do	0.3-0.5	do

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